

87 Years of . . .
Vertical
Transportation
with
Otis elevators

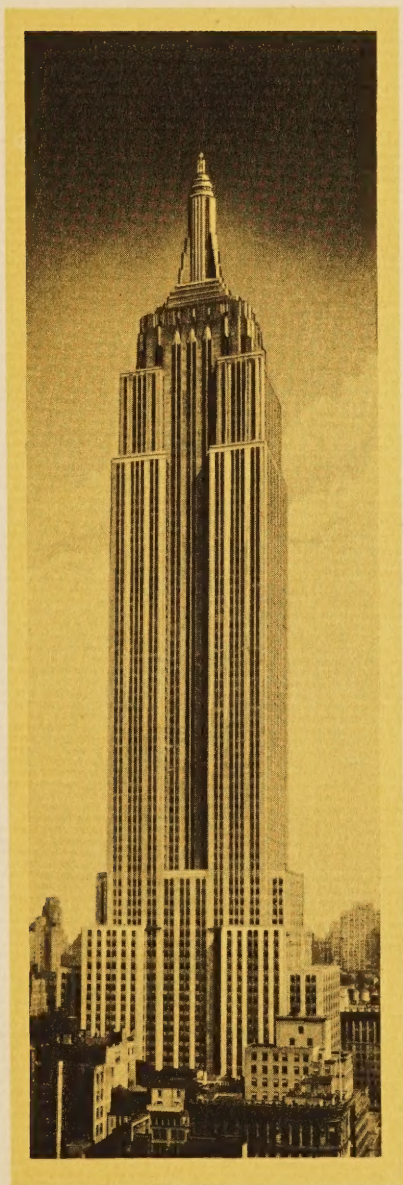


Illustration on Front Cover
is

Empire State Building
New York

102 floors, 1248 feet high.

Architects:
Shreve, Lamb & Harmon.

Engineers:
Meyer, Strong & Jones.

Contractors:
Starrett Bros. & Eken.

Completely equipped
with
67 Otis elevators



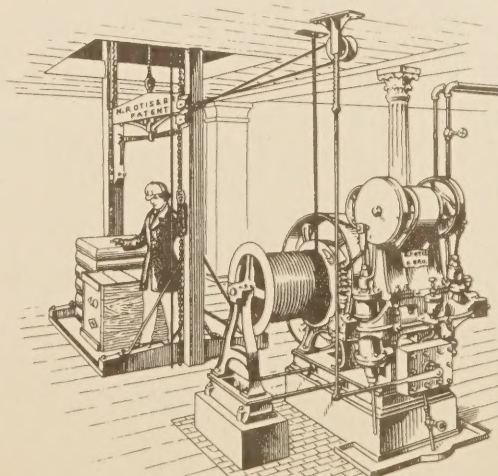
THE history of the Otis Elevator Company is the history of the development of the elevator art. Since 1852, when Elisha Graves Otis invented and demonstrated the first elevator "safety" — a device to prevent an elevator from falling if the hoisting rope broke — the name Otis has been associated with virtually every important development contributing to the usefulness and safety of elevators. The first elevator safety was exhibited by Elisha Graves Otis at the Crystal Palace Exposition in New York City in 1853, and from that day to this Otis has continued to be

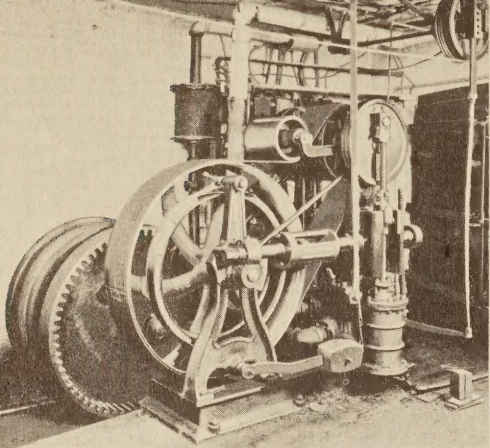
"The World's Word for Elevator Safety", as well as the source of innumerable improvements and inventions which have marked the development of the elevator from the first crude belt-driven freight hoist to the miracle of speed, smoothness and efficiency typified by the modern gearless elevator with Otis Peak-Period Control.

The pre-eminence of the Otis Elevator Company in all fields of vertical transportation is evidenced by the fact that throughout its history it has continued to be the largest elevator company in the world. The Company now has three manufacturing plants and 170 offices in the United States alone. It employs over 12,000 people, and in 1938 installed Otis elevators in fifty-one different countries. In addition Otis and its Associated Companies have 185 offices in all other parts of the world, with manufacturing plants in Canada, England, France, Belgium, Germany, Italy, Australia and Japan, and also assembly plants in Rio de Janeiro and Buenos Aires.

It has been the Otis policy not only to continue to improve all existing equipment to the highest practicable degree of perfection, but to seek constantly to develop new and better elevator equipment of a type previously unknown. To this end, the Otis Elevator Company has for more than forty years maintained the largest elevator engineering organization in the world, and has made available to the public the product of its extensive research and invention.

Early Steam Elevator





IN THE long list of notable Otis achievements which have marked the advancement of the elevator industry, the following are of particular interest and historical significance:

In 1857 the first known passenger elevator was installed by Elisha Graves Otis in the store of E. V. Haughwout and Company, Broadway & Broome Street, New York City. This elevator was of the belt-driven type, and marked the beginning of an era in which elevators have made possible buildings of constantly increasing height. After the death of Elisha Graves Otis in 1861, his sons, Norton P. Otis and Charles R. Otis, continued the business under the name of N. P. Otis and Brother and, in 1865, built a new elevator factory in Yonkers, New York, and adopted the name Otis Brothers and Company. During this period they invented and developed a screw-type belt machine and a stationary-cylinder steam engine which represented a marked improvement over the elevator equipment previously available.

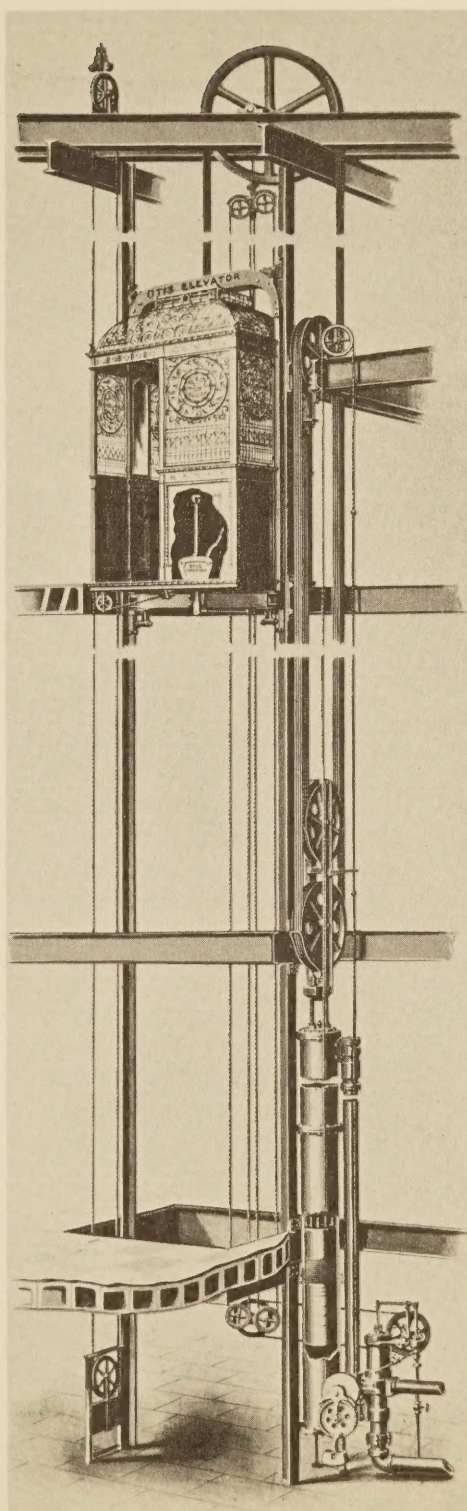
1872 marked the advent of a radically different type of elevator capable of much higher speeds than ever before. It was invented by C. W. Baldwin, who joined the Otis organization and assisted in the development of this new equipment. This geared hydraulic elevator consisted of a cylinder and piston mounted vertically in the elevator hoistway adjacent to the elevator car and was arranged to raise and lower the car through the medium of multiple sheaves and iron ropes. The water pressure was supplied by steam-driven pumps and the system of tanks — with the necessary piping — required considerable space in the basement of the building served. However, the vertical geared hydraulic elevator — and the horizontal geared hydraulic elevator, a modification also developed by Otis Brothers and Company, — made available a car speed of 600 feet per minute, and furnished a tremendous impetus to the erection of higher buildings than had theretofore been commercially practicable. For many years geared hydraulic elevators continued adequate in speed, capacity and rise but much still remained to be accomplished to reduce space requirements and cost of installation and operation, and to increase safety and ease of operation.

In 1878 a speed governor, invented by Charles R. Otis, contributed immensely to the safety of elevators by providing

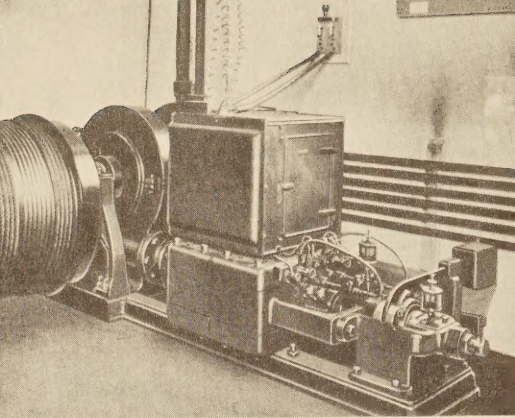
a practical and reliable device for stopping the elevator safely in the event of excessive downward speed from any cause. Prior to that time, elevator safety devices had been operative only in the event of broken hoist ropes. The speed governors used today employ the same basic principle embodied in the governor invented by Charles R. Otis more than sixty years ago.

The first two successful electric elevators were installed in 1889 by Otis Brothers and Company in the Demarest Building, 33rd Street and Fifth Avenue, New York City, where they continued in service until the building was torn down thirty years later. These elevators were operated by worm-gearred drum machines with direct-current motors, and were similar to those used for limited rise and for speeds up to 400 feet per minute for the next twenty years. With this type of elevator, the height of travel was limited by the width and size of the drum, and the speed by the limitation of the worm gearing. Hydraulic elevators therefore continued to be used for a number of years for high-speed, high-rise installations.

1892 witnessed the first automatic or push-button controlled elevator — limited at that time to slow-speed elevators of the type installed in residences and small apartment houses.



First Electric Elevator Machine



In 1898 the Otis Elevator Company was incorporated, and in that year contributed materially to the development of high-speed, high-rise direct-plunger elevators which offered high speed and smooth operation but were necessarily expensive to install because of the fact that the cylinder had to be sunk

in the ground a distance slightly in excess of the travel of the elevator. A large number of elevators of this type were installed throughout the country — some of which served buildings thirty stories high.

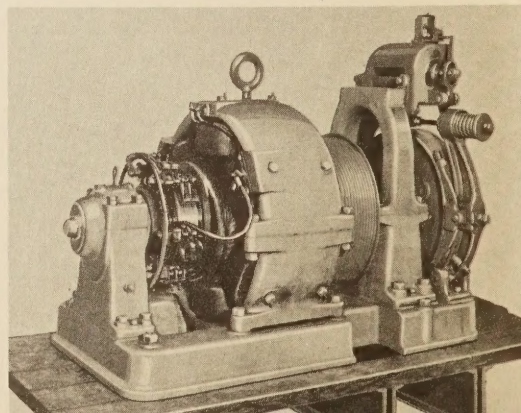
In 1900 a new and unique type of vertical transportation was made available by the Otis Elevator Company in the form of the first Escalator. It was of the flat-step type and, after being exhibited at the Paris Exposition, was installed in a department store in Philadelphia where it is still in operation.

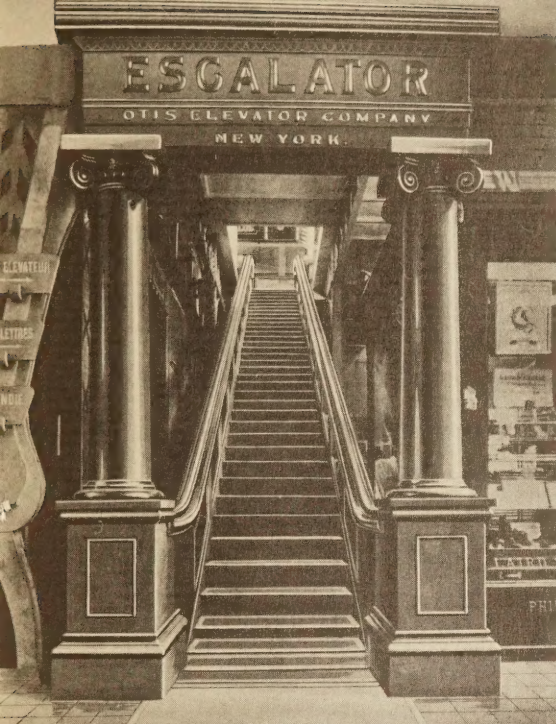
The utility of Escalators in transporting large crowds led to the installation of hundreds of Otis Escalators throughout the world in department stores, subways, elevated railway and railroad stations. Continued improvement in design and appearance has greatly widened the field of application, and today the Otis Escalator with its paneled or streamlined nickel-silver balustrading and stainless-steel risers is widely used in the highest class department and specialty stores as well as in banks, restaurants, show rooms, and office buildings.

The Otis Elevator Company was the first to employ the Ward Leonard principle of control in connection with elevators, and in 1895 installed the first elevators using this type of operation. This same principle, now known as Unit Multi Voltage, still furnishes the smoothest type of control so far obtainable.

One of the most important contributions to the elevator art was the development by the Otis Elevator Company in 1902 of the gearless traction electric machine — the

First Gearless Elevator Machine





*First Escalator —
Paris World's Fair, 1900*

first commercial installation of which was in the Majestic Theatre Building in Chicago, and is still operating satisfactorily. As the name indicates, this machine has no gears and the driving sheave is mounted directly on the armature shaft. A gearless traction machine can be used for any rise and, depending on size, is capable of any desirable speed. With the advent of the gearless machine, the limitations of available methods of control furnished the principal limitation on practical elevator speed — as it was found that even

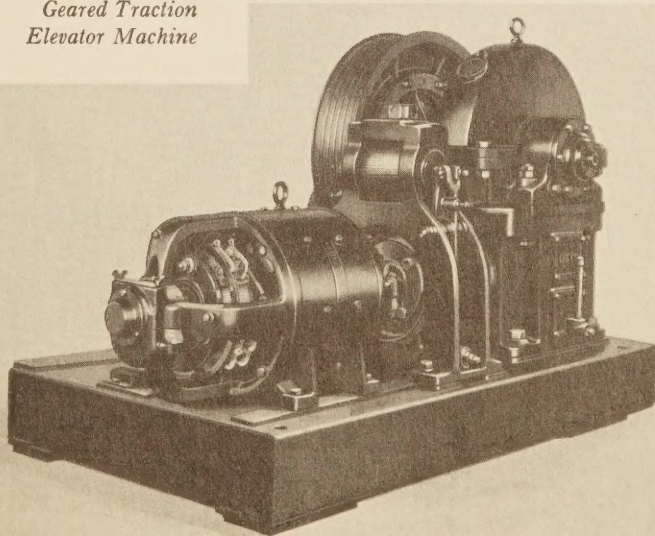
skilled operators could not secure accurate landings with variable loads with a speed in excess of 600 feet per minute.

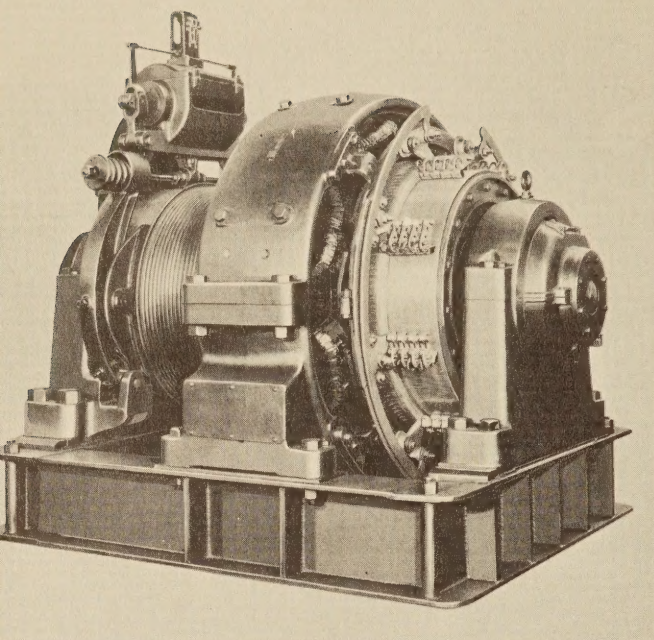
In 1908 the Otis Elevator Company successfully applied to geared elevators the traction principle embodied in the gearless traction elevator and, in so doing, added immeasurably to the utility and safety of geared elevators.

In 1911 the traction principle was adapted to single wrap roping on geared elevators.

In 1915 the effective speed of elevators was still further increased through the invention and development by the Otis Elevator Company of Micro-Drive — an ingenious arrangement for automatically bringing the car platform level with the landing and main-

*Geared Traction
Elevator Machine*





taining this level regardless of stretch of cables or change in load. Self-leveling contributed materially to safety by reducing the stumbling hazard, and speeded up elevator service by facilitating a prompt and accurate landing.

There remained to be overcome, however, the in-

herent limitations of human operators. At speeds in excess of 600 feet per minute the demand imposed on operators for split second reactions to blurred floor numbers, flashing signals and requests from passengers proved to be greater than that with which the most skilled operator could comply. This apparently insuperable obstacle was completely overcome by the Otis Elevator Company by a series of inventions beginning about 1920, which resulted in the development of Signal-Control. Signal Control completely relieves the operator of all duties except that of pressing buttons to register the destinations of passengers and closing the door and starting the car. The ability of the operator is no longer a limiting factor in determining the attainable or desirable speed of an elevator. As a matter of fact, one of the factors limiting car speed is the rate of change of atmospheric pressure to which passengers can comfortably adjust themselves.

Otis Signal Control made available elevator speeds up to 1400 per minute, and made commercially practicable such monumental structures as the Empire State Building, New York, which towers 1248 feet above Fifth Avenue and is equipped with 58 Otis Signal-Control Elevators.

Upon Otis Signal Control and Otis engineering genius also depended the commercial feasibility of such buildings as the sixty-three story Sixty Wall Tower in New York City where the limitations of space dictated the installation of eight double-deck Signal-Control elevators, for Tower Service, each of which serves two floors simultaneously and the installation uses only 60% of the hoistway space that would

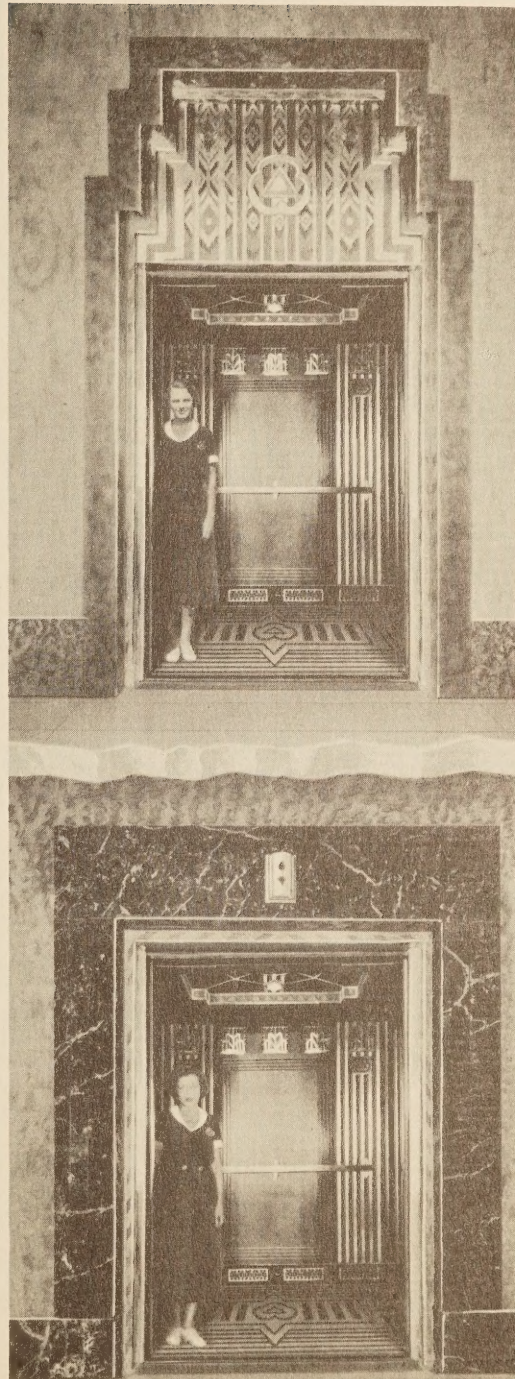
be required if single-deck elevators were used to furnish equivalent service.

To serve buildings where it is desirable for passengers themselves to operate the cars, Otis developed a form of automatic operation by means of buttons, and known as Collective-Control. This type of control is extensively used in apartment houses, hospitals and small hotels.

Otis developments, extending over a period of eighty-seven years, have created and are continuing to maintain a line of elevator equipment specifically designed to fulfill all the requirements of vertical transportation so far encountered. However, a high standard of elevator service depends, not only upon the use of well designed and carefully manu-



factured equipment, but upon the number, location, capacity and speed of the elevators specified, and upon the type of control, accessories and method of operation. Upon the correct determination of each of these variable factors depend the adequacy and quality of



*Escalator with
Nickel-Silver Balustrading*



the elevator service, and, in many instances, the utility and commercial success of the building served.

Otis engineering experience and facilities are available to architects, engineers and building owners without obligation for the purpose of recommending the proper equipment for conditions commonly encountered or for providing the solution to any problem of vertical transportation, however unusual.

With the development of the Otis elevator it soon became apparent that proper service facilities were necessary if the elevators were to be maintained at the point of highest efficiency. This resulted in the establishment of service facilities in all of the branch offices, consisting of a stock of necessary replacement parts and special tools to perform service work in the most efficient manner. Supervisors and skilled mechanics were also made available to render service night or day.

This service has been developed to a point where thousands of owners place their elevators completely in Otis' care for a reasonable fixed monthly sum under an Otis Maintenance Contract. This contract provides for frequent examinations at regular intervals and the replacement of all worn parts, thus assuring the owners of maximum safety and the same performance at all times that was built into the original equipment.

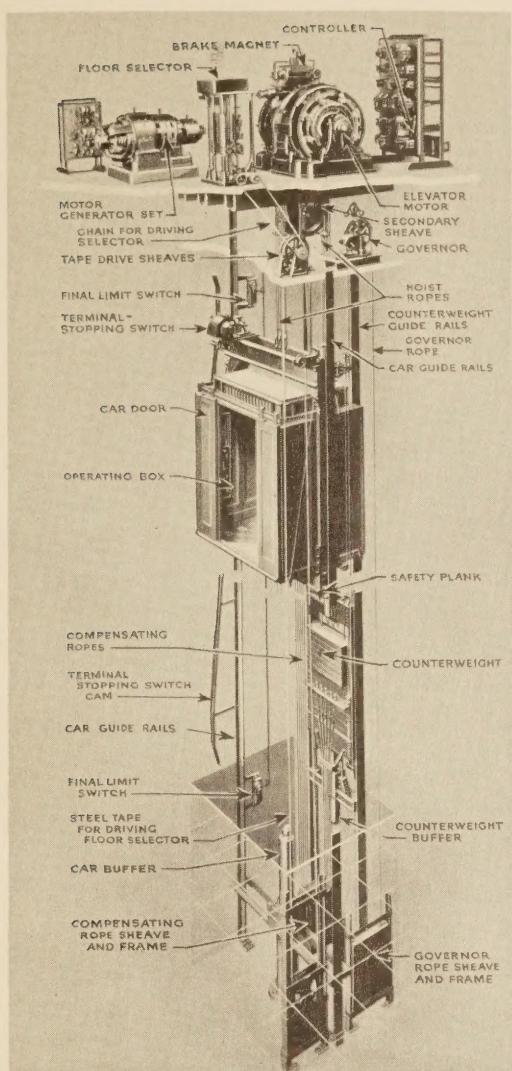
The purchasers and users of Otis Elevators are the beneficiaries of the knowledge and experience derived from more than three-quarters of a century devoted exclusively to the design, manufacture, installation and maintenance of elevators and escalators.

OTIS ELEVATOR COMPANY

General Offices

260 Eleventh Avenue

New York, N.Y.



Typical arrangement of Otis Signal-Control Gearless Traction Passenger Elevator



Illustration on back cover is
S. S. AMERICA of the U. S. Lines
 Largest ship constructed in the United States.
 Equipped with Otis Elevators.

